

Institutional Perspectives on Real Estate Investing

The role of risk and uncertainty.

Ravi Dhar and William N. Goetzmann

Institutional investors face a complex set of choices with respect to the composition and management of the investment portfolio. While modern portfolio theory provides a theoretical framework for this process, allocation decisions in practice must be made in the face of incomplete information, changing estimates of return, and shifting definitions of the risk of investment.

Real estate presents a particularly interesting case for institutional investors. Choices about investment vehicles have expanded over the past two decades with the rise of REITs, and the secular trends in property returns—ranging from the credit crunch of 1990 to the boom in the early 2000s—making long-term forecasts of risk and return challenging.

To understand the factors that determine an institution's allocation to real estate we survey a large sample of major institutional investors in an electronic questionnaire. Investors in our sample were willing to answer many questions about their target real estate allocation, their plans to increase or reduce their allocations, their primary reasons for investing in real estate, and their views on its major risks and relative expense. They also provided us with information about their basic approach to portfolio allocation decisions, and how real estate fits into this approach.

Our findings from this survey not only tell us a lot about how investors view real estate as an asset class, but are also instructive as to the current state of the art in institutional asset allocation decision-making. While long-term estimates of risk and return are the driving factors in the investment decision process, we find a strong trend among institutional managers toward increasing their real estate allocations, primarily among managers who are

RAVI DHAR

is George Rogers Clark
Professor of Management
and Marketing and
Director at Yale Center
for Customer Insights in
New Haven, CT.
ravi.dhar@yale.edu

**WILLIAM N.
GOETZMANN**

is Edwin J. Beinecke
Professor of Finance and
Management Studies and
Director at International
Center for Finance in
New Haven, CT.
william.goetzmann@yale.edu

comfortable in relying on historical statistics about real estate returns.

These basic findings lead us to conjecture as to the role of uncertainty—as opposed to risk—in the investment decision process. Risk is a statistical input that is clearly defined and easily handled by modern portfolio theory. Uncertainty, though, is a lack of confidence about exactly what statistical inputs to use in the decision model.

Our results suggest that uncertainty plays some role in decision-making. This is interesting from an academic perspective, because it suggests that uncertainty can affect demand for assets and thus ultimately their price. It is important practically, because it suggests that more complete information about the long-term performance of an asset class may actually help resolve uncertainty and affect institutional investor demand.

Yet we also find some results suggesting investors are comfortable with high levels of uncertainty with respect to other asset classes—hedge funds and venture capital in particular. If uncertainty appears to affect the choice about real estate at the margin, our survey finds that institutions as a whole are investing in some asset classes where they are not generally comfortable using past results to forecast future performance. Alternative models, such as return-chasing or following industry leaders, might explain the phenomenon.

SURVEY PROCESS

To develop the questionnaire, we first conducted a series of interviews with leading real estate professionals. These included institutional managers as well as consultants. The goal of the interviews was to understand the major issues confronting institutional investors with respect to real estate, and to ensure that the questionnaire reflected actual practice.

The interviewees had a number of helpful insights about how real estate is treated in the investment decision-making process, the role of consultants, and the basis for estimation of risk and return. We incorporated these views into the structure of the questionnaire.

We engaged Greenwich Associates to conduct the questionnaire on our behalf. The target audience was chief investment officers and real estate professionals at major public and private institutions. They were approached by electronic mail regarding their willingness to participate in our research survey, and their responses were collected via a website. Respondents were not asked to

identify themselves or their institution, but were asked some general information about their firms and positions.

Approximately 1,500 e-mails were sent. We ultimately collected 173 completed questionnaires, plus an additional 30 incomplete questionnaires; some prompting and additional communication helped to increase the sample size. As part of our communication, we promised to make the results of the analysis available to the participants.

Exhibit 1 summarizes the sample. Respondents identified the type of institution and the assets currently under management. Corporate pension plan sponsors are the largest group by number, and public pension plan sponsors are the largest by assets, with more than \$1 trillion in late 2004 when the survey was conducted.

Respondents also supplied their titles. One hundred twenty-two of the titles were indicative of a leading or at least a significant decision-making role in asset allocation policy. The largest group of these included 22 chief investment officers, but other respondents identified themselves variously as chief financial officers, directors of investments, treasurers, or presidents. Twenty identified themselves as real estate specialists within the organization.

RESPONSES

Questions 1 through 5 address the real estate investment policy specifically. We asked how long the institution has been invested in real estate, what form the investment takes, what the target allocation is, whether the institution is near its target, and whether it is planning to increase its allocation.

Question 1 indicates that a surprising number of institutions, nearly 60, do not invest in real estate at all. The distribution of funds that do invest in real estate is bimodal; 35 have invested in real estate for less than three years, and most of the others for more than ten years.

Question 2 indicates that commingled funds and partnerships are the primary forms of institutional invest-

EXHIBIT 1 Sample Size, Composition, and Assets Under Management

	Responses	Complete	Assets (in \$MM)
Endowment/Foundation	65	60	94,184
Corporate Pension	83	68	274,556
Public Pension	52	43	1,114,916
Union	2	2	1,310
Total	202	173	1,484,966

ment, although more than 60 funds reported they use real estate investment trusts (REITs). Of the funds invested in real estate, replies to question 3 indicate that the modal allocation is 3% to 5%; 10% or more is extremely rare. The two major reported target allocations, reported in question 4, are 3%–5% and 7%–10%.

Despite these relatively low current allocations to real estate, a large number of funds said that they were somewhat below their target and planned to increase their allocations (questions 5 and 7). In question 7, for example, more than 30 funds reported plans to increase their allocations, while only two planned to reduce it. This provides an opportunity not only to investigate the stated reasons associated with a particular allocation, but also to understand the factors related to a change in position—in this case a recent increase.

Exhibit 2 cross-tabulates the response of each category of investor by the length of investment in real estate. Endowments and foundations have the shortest average experience with the asset class; 33% have been invested less than three years. The public pension plans have a fairly long-term experience with real estate. More than half have greater than ten years of real estate investment history. Corporate pensions are the largest group with no real estate—41% are out of the asset class entirely.

Exhibit 3 reports answers to the question of whether the institution is planning to increase or reduce allocations to real estate. It classifies results by type of institution, and reports percentages for comparison. More than half of the endowments and foundations seek to increase

their exposure to real estate, compared to less than 30% for the other two classes. None of the endowments or foundations reported planning to reduce real estate exposure.¹

There are a number of theories that might explain the difference between endowments and pension plans, ranging from differing liability structures, differing regulatory constraints, differing use of advisors and consultants—even institutional/cultural differences in investment management. Endowment funds' level of activity depends significantly on their funds. Endowments regularly survey peer allocations and practices, which might induce similar behavior. For universities, deviation from the allocation norm presents the potential of an increase in assets, but also the risk of a permanent negative shock to spending capacity.²

Whatever the reasons for institutional differences, Exhibits 2 and 3 taken together suggest heterogeneity in respondents with respect to experience with real estate as an asset class, and also with respect to plans to increase investment. Endowments and foundations have less experience and are as a group planned to increase their investment.

One set of questions directly solicited views on the benefits and risks of real estate investment and the factors influencing the decision to allocate to real estate. Question 8 asked for the three top reasons for investing in real estate: diversification, cash generation, potential for capital gains, inflation hedging, long-term benefits, or other. Diversification and inflation hedging are the leading reasons for including real estate in the portfolio, as opposed to long-term return or income generation (Exhibit 4).

EXHIBIT 2

Cross-Tabulation of Investment in Real Estate versus Type of Institution

	0 to 2 years	3 to 4 years	5 to 10 years	11 to 20 years	20+ years	No RE
Endowment/Foundation	0.328	0.069	0.207	0.172	0.052	0.172
Corporate Pension	0.121	0.045	0.106	0.182	0.136	0.409
Public Pension	0.088	0.059	0.059	0.441	0.176	0.176

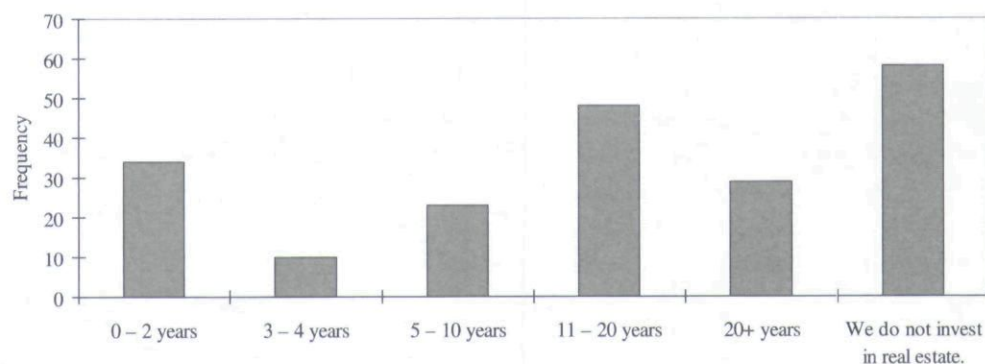


EXHIBIT 3

Cross-Tabulation of Plans to Increase Allocation versus Type of Institution

	Increase	Reduce	Stay the Same	Uncertain
Endowment/Foundation	0.552	0.000	0.276	0.172
Corporate Pension	0.288	0.045	0.470	0.197
Public Pension	0.294	0.029	0.500	0.176

Note: Rows sum to 100%

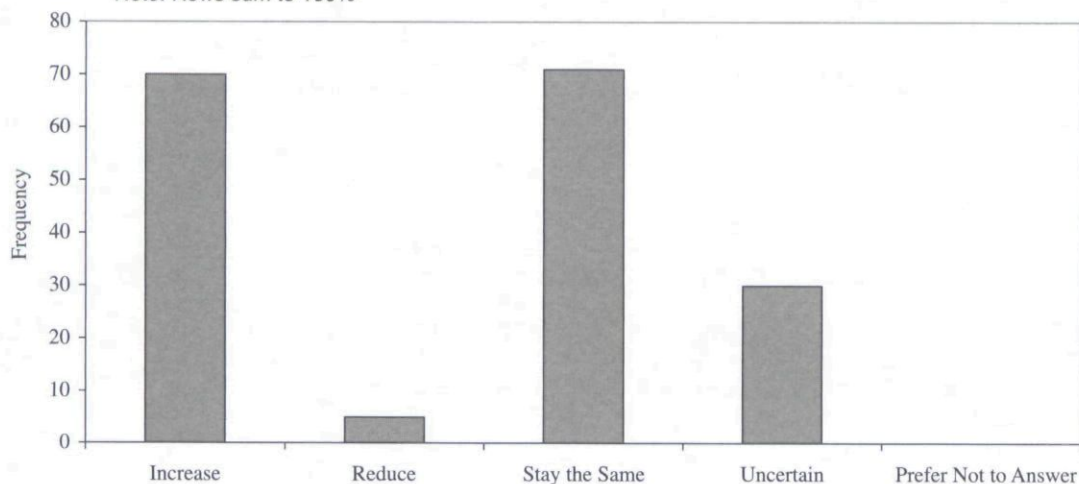
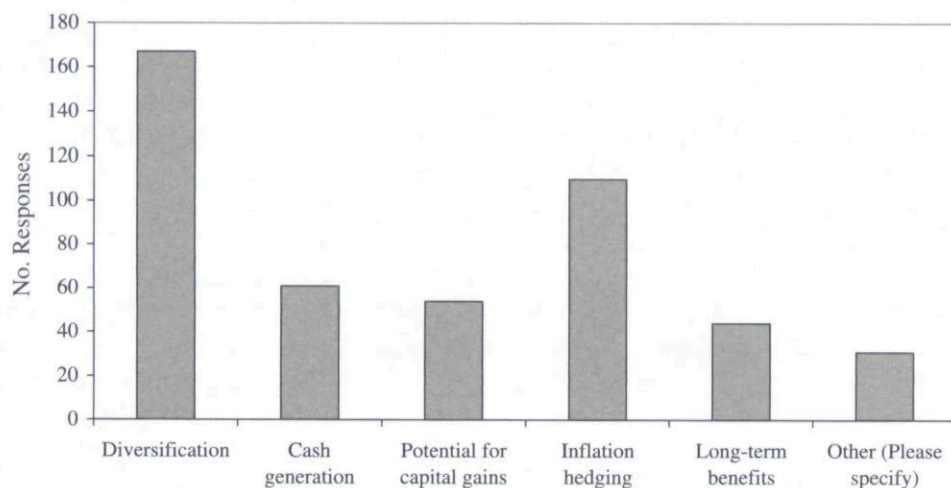


EXHIBIT 4

Reasons for Investing in Real Estate



Real Estate Compared with Other Asset Classes

The survey posed a number of questions about real estate compared to other asset classes. Many of these questions were in the form of a matrix that implicitly required relative ranking of risk and return among a broader set of

asset classes. Question 9 asked, "Based on the scale below, how does the long-term expected return, for the real estate component in your portfolio, compare with the long-term expected return for the following asset classes in your portfolio?"

Exhibit 5 reports the results. Most managers believe real estate has an expected return a little above fixed-income

EXHIBIT 5

Responses to Question 9—Relative Expected Return

	Equity	Fixed-Income	Hedge/AR	PE/VC	EM
ER of RE Significantly Less	6.4%	1.7%	4.0%	30.1%	24.3%
ER of RE Little Less	42.2%	4.6%	16.8%	31.8%	34.1%
ER of RE Same	22.5%	5.8%	24.3%	7.5%	6.9%
ER of RE Little More	15.0%	55.5%	13.3%	1.7%	4.6%
ER of RE Significantly More	1.7%	20.2%	2.3%	0.6%	0.6%
Don't Know	12.1%	12.1%	39.3%	28.3%	29.5%

A statistical test of responses to question 9 rejects the null significantly: chi-square = 2.94, df = 20, p-value = 1.

EXHIBIT 6

Responses to Question 10—Relative Risk

	Equity	Fixed-Income	Hedge/AR	PE/VC	EM
ER of RE Significantly Less	11.6%	2.3%	9.8%	42.8%	41.0%
ER of RE Little Less	49.1%	11.0%	30.6%	30.6%	31.2%
ER of RE Same	21.4%	14.5%	18.5%	5.8%	5.2%
ER of RE Little More	11.0%	54.3%	13.3%	1.2%	1.2%
ER of RE Significantly More	0.6%	11.0%	3.5%	2.3%	1.7%
Don't Know	6.4%	6.9%	24.3%	17.3%	19.7%

and a little less than equity. They expect hedge funds and absolute return strategies to return about the same, and private equity, venture capital, and emerging markets to return a little more or significantly more.

The last row in Exhibit 5 reports frequencies of the “I don’t know” response, which can be interpreted as not having a clear expectation of the relative return of real estate with respect to the given asset class. For the standard asset classes—stocks and bonds—this was an infrequent response. For the alternative assets, “I don’t know” was much more common. Nearly 40% of respondents could not rank the relative return of real estate versus hedge funds.

It is of some interest that respondents did not take a Bayesian approach to this and rank the expected returns as about equal, which was the next-highest frequency count. Given the contrast between the results for stocks and bonds and the results for the last three asset classes, one interpretation of Exhibit 5 is that there is a high degree of uncertainty about the expected returns to alternatives.

Exhibit 6 represents relative rankings in terms of risk (question 10). These responses are broadly similar to the relative ranking of expected returns—and reflect equilibrium expectation that higher expected return compensates for higher risk.

Interestingly, the “don’t know” response for risk is less frequent for all asset classes. From a statistical

perspective, this is consistent with the idea that risk can be better estimated than expected return over shorter horizons.

Risks and Influences

Question 11 asked for the main risk factors associated with real estate investing (Exhibit 7). Liquidity risk, lack of reliable data, and the risk of making a poor investment are the top three perceived risk factors. Contrary to what we might expect from a classic asset allocation model, asset volatility is not regarded as a major risk factor.

To look deeper into the perceived risks, and whether a different perception of real estate risk might explain non-participation in the asset class, we isolate the responses to question 11 for those who replied in question 1 that they were not in real estate at all. The distribution of responses was virtually identical.

Question 12 asks for the three main factors influencing the real estate investment decision (Exhibit 8). This considerable list, generated with the help of the initial interviewees, includes statistical estimates of risk and return, advice from internal staff, advice from external consultant, advice from other investors, economic forecasts, current market values of asset, recent trends in the market, long-term historical performance, expected changes in the economic outlook, actions taken by industry peers, and relative skill of external manager with this asset class.

The top three indicated are statistical estimates of risk and return, long-term historical performance, and relative skill of the external manager with the asset class. (We asked the same set of questions about equity investment in question 13, and the distribution of responses was similar.)

The responses to question 12 are largely but not completely consistent with the tenets of modern portfolio theory. Portfolio theory stresses long-term historical performance and relies on statistical estimates of risk and return. The risk factor in the standard portfolio optimization model is quantified as asset volatility. Uncertainty about the inputs, however (lack of reliable data), was more important to the respondents to question 11 than volatility, suggesting that uncertainty rather than risk might loom large as a determinant of allocation. (We examine this issue in greater depth later.)

EXHIBIT 7

Top Risk Factors in Real Estate

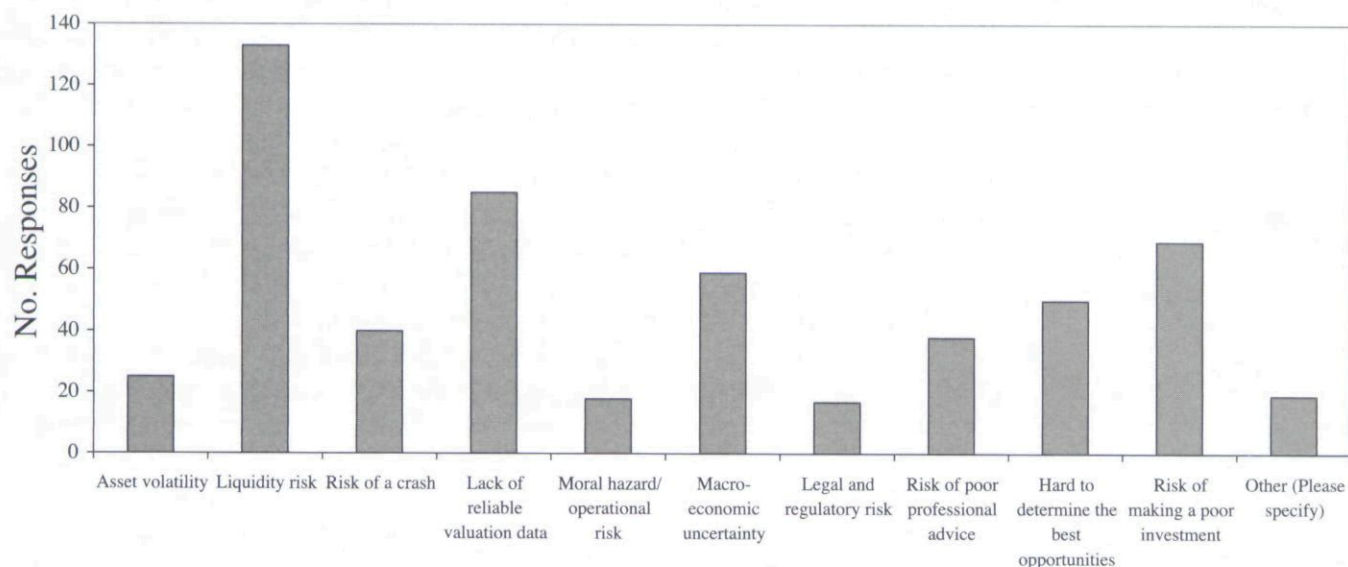
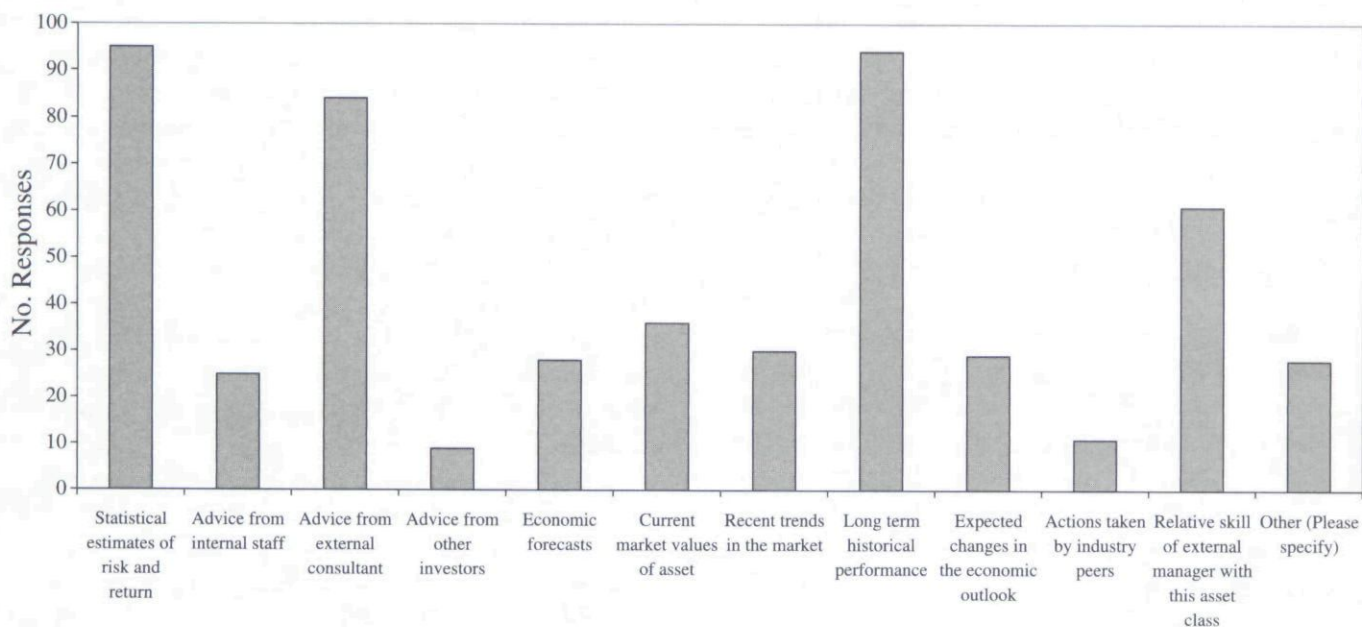


EXHIBIT 8

Top Factors Influencing Real Estate Allocation Decision



When we cross-tabulate the *statistical estimates of risk and return* and *long-term historical performance* responses with whether investors held real estate, we find a statistically significant negative relationship. That is, being out of real estate is consistent with placing less emphasis on these two inputs to the allocation process. Although the values are

not tabulated, the chi-square for independence between holding real estate and the response, statistical estimates of risk and return, is 4.7215 ($df = 1$, $p\text{-value} = 0.02979$). The chi-square for independence between holding real estate and the response, long-term historical performance, is 8.3748 ($df = 1$, $p\text{-value} = 0.003805$).

Our interviews suggested that the relative management cost of real estate might be an important factor in the decision to invest in the asset class. Question 14 asks about the relative cost of managing various asset classes. Responses indicate that real estate is perceived as more costly to manage than stocks and bonds but less costly than other alternative asset classes. Actually, "I don't know" was the most frequent response to the question comparing the costs of real estate to alternatives.

Absent any difference in relative cost, the estimates for real estate in Exhibits 5 and 6 should put it roughly between stocks and bonds in mean-standard deviation space. This does not mean that it would dominate the optimal portfolio for its level of risk, however. It is conceivable that a very low correlation between stocks and bonds together and a high correlation between stocks and real estate could lead to a low real estate allocation in optimal portfolios. We did not directly ask about correlation with other asset classes, but the one most common response to question 8, the primary reasons to invest in real estate, is diversification, which implies an expectation of low correlation between real estate and other assets in the portfolio.

Taken together, the responses about relative risk and return appear inconsistent with the reported low allocation to real estate in the survey—at least if respondents' portfolio choice is based upon modern portfolio theory and the classic approach of estimating statistical inputs, constructing an efficient set of portfolios, and investing in one that best suits the risk preferences of the institution.

Explanations for Allocations

What factors might explain this apparent contradiction? First, allocation might not be based on modern portfolio theory. Second, additional factors affecting risk and return estimates—such as the higher cost of real estate reported in Exhibit 9 or the liquidity risk and risk of poor

management mentioned in question 11, might explain the lower allocations.

Allocations might instead be based upon other factors such as peer group allocations, or the recent performance of asset classes. Real estate performed well in the four-year period before the survey; geometric annual returns to the National Association of Real Estate Investment Trusts (NAREIT) were 19.61% from September 2000 through September 2004. Returns to unlevered institutionally held real estate, compiled by the National Council of Real Estate Investment Fiduciaries (NCREIF) were 9.41% over the same period.

This behavioral explanation is certainly worth considering, although the respondents to the survey are among the leading professionals in the investment management business—this would not be the natural group to look to for casual, biased, or irrational decision-making.

Another explanation is whether uncertainty itself might play a role in the allocation choice. The application of modern portfolio theory, as developed by Harry Markowitz, is almost mechanical once all the parameters of the asset return distributions are known. In practice, though, the investor faces considerable uncertainty as to the true underlying return-generation process. Can past performance in a particular asset be relied on to provide meaningful inputs to the investment process?

More broadly, the investor faces uncertainty about the general set of distributions that may characterize a particular asset. For example, can the statistical parameters be estimated from historical data, or are they changing and evolving through time? How does survival bias affect the statistical inputs? Is there a significant potential of market failure for the asset? Will covariances suddenly shift? These questions form the very real backdrop of institutional investor choice, yet the Markowitz model is largely silent on them.

Academic research provides several reasons to believe that the allocations to real estate are driven by past norms.

The first is the theoretical analysis of uncertainty as opposed to risk. Suppose an investor wanted to use a risk-return model but was unable to reasonably estimate the risk and return parameters. Bewley [1986] finds that in this situation investors might be prone to stick with their past investment choices, even though that meant underdiversification. In effect, the devil we know is preferred to the devil we don't.³

EXHIBIT 9

Responses to Question 14—Relative Cost

	Equity	Fixed-Income	Hedge/AR	PE/VC	EM
ER of RE Significantly Less	4.6%	6.4%	15.0%	21.4%	4.6%
ER of RE Little Less	7.5%	4.6%	20.8%	23.7%	15.6%
ER of RE Same	12.7%	5.8%	15.0%	18.5%	22.0%
ER of RE Little More	38.7%	23.1%	4.6%	0.0%	19.7%
ER of RE Significantly More	17.3%	41.0%	0.0%	1.7%	2.9%
Don't Know	19.1%	19.1%	44.5%	34.7%	35.3%

Behavioral researchers have likewise focused on investment decision-making under uncertainty. The anchoring and adjustment heuristics, the proposed by Tversky and Kahneman [1974] would suggest that investors determine future allocations by initially anchoring on their current allocations. In this sense, the current allocation is conceptually a safe harbor and becomes the benchmark from which the institution diverges as new information becomes available. Thus, if the initial allocation to real estate were 3%, a 6% allocation would be regarded as a fairly extreme deviation from policy—a doubling of exposure. Evidence from behavioral studies suggests that the more complex the task, the stronger the anchor on the status quo.

Finally, economists who study institutional behavior as opposed to individual behavior make predictions about the conditions under which the status quo strategy will be preserved. Hirshleifer and Welch [2002] argue that the institutional memory for the original reason behind a decision fades with the departure of people from the organization. As a result, remaining managers have a strong bias toward the status quo in a steady economic environment, although in a volatile environment they might exhibit impulsiveness.

While we cannot hope to test the entire range of theories about decision-making under uncertainty, our questionnaire provides a basis for investigating at least two key questions. Of the three primary risk factors that our respondents note about real estate investing, two relate to uncertainty about asset valuation and price efficiency, and one relates to uncertainty about historical estimates of risk and return.

Liquidity risk is the risk that you cannot sell an asset for what it is worth—its economic value—when you need to. The risk of making a bad investment is the risk that you pay too much for a property. Both of these relate to the efficiency of the market.

EXHIBIT 10

Responses to Question 16—Relative Efficiency of Asset Classes

Real estate is:	EQ	FEQ	EM	Debt	HY	Com
Substantially Less Efficient	22.5%	11.0%	4.6%	28.3%	5.8%	11.6%
Somewhat Less	30.6%	34.7%	18.5%	33.5%	31.2%	20.8%
About As	17.9%	16.8%	16.2%	21.4%	30.1%	14.5%
Somewhat More	15.0%	20.2%	29.5%	2.9%	13.9%	15.6%
Substantially More Efficient	4.0%	4.6%	13.9%	2.9%	2.3%	3.5%
Don't Know	9.8%	12.7%	17.3%	11.0%	16.8%	34.1%

Emerging markets: Chi-square = 21.415, *df* = 15, *p*-value = 0.1241. High Yield: Chi-square = 22.367, *df* = 15, *p*-value = 0.09854.

Question 16 is on the relative efficiency of the major asset classes. It states, “One definition of an efficient market is a market in which the price of an asset is highly likely to be equal to its economic value. By this measure, and based on the following scale, how does the efficiency of the real estate market compare to the following asset classes?”

Besides real estate, we asked about U.S. equities (EQ), foreign equities (FEQ), emerging markets (EM), fixed-income (Debt), high-yield debt (HY), commodities (Com), hedge funds (HF), and venture capital (VC).

The responses in Exhibit 10 place real estate somewhere between emerging markets and high-yield debt in terms of efficiency. It is perceived as substantially or somewhat less efficient than U.S. equities, foreign equities, and fixed-income. The most common response for commodities was “don’t know.”

To test whether views of real estate efficiency influenced the target allocation to the asset class, we take the relative efficiency compared to emerging markets (as well as high-yield) as potentially salient, and test the relationship. The test statistics are reported as a note to Exhibit 10. There is a positive but statistically marginal co-variation in these two tests. That is, the greater the perceived relative efficiency, the greater the allocating to real estate.

To address the issue of uncertainty regarding statistical estimates—our closest analogue to Knightian [1921] uncertainty—we asked about the level of comfort in extrapolating future performance from historical performance. Question 15 is: “Based on the scale below, for which of the following asset classes are you most comfortable extrapolating future performance from historical performance?” Responses were on a five-point scale from “least comfortable” to “most comfortable” as well as “don’t know.” They are reported in Exhibit 11.

Respondents were most comfortable with extrapolating the performance of U.S. equities and fixed-income from historical performance and least comfortable with extrapolating the performance of hedge funds, commodities, and venture capital. Real estate was closer to stocks and bonds than other alternatives—investors were slightly more comfortable with historical data from real estate than from high-yield debt and foreign equities. As in prior results, the “don’t know” response was common for many kinds of alternatives.

The striking evidence in question 15 is the uncertainty associated with hedge funds, venture capital, and commodities.

EXHIBIT 11

Question 15—Extrapolation Comfort

	Least com.	2	3	4	Most com.	Don't know
RE	9.8%	15.0%	30.1%	30.6%	4.0%	10.4%
EQ	10.4%	15.0%	26.0%	29.5%	14.5%	4.6%
FEQ	11.6%	26.6%	27.2%	24.3%	4.0%	6.4%
EM	22.5%	35.3%	19.7%	11.6%	0.0%	11.0%
Debt	8.1%	11.0%	27.7%	31.2%	16.8%	5.2%
HY	13.9%	20.2%	33.5%	21.4%	1.2%	9.8%
Com	27.2%	21.4%	15.6%	7.5%	0.0%	28.3%
HF	34.7%	21.4%	15.0%	4.0%	0.0%	24.9%
VC	26.0%	27.2%	21.4%	4.6%	0.0%	20.8%

EXHIBIT 12

Comparison of Target Allocation to Real Estate with Comfort of Extrapolation

Allocation	Least com.	2	3	4	Most com.	Don't know
0-1	18.4%	18.4%	20.4%	14.3%	0.0%	28.6%
1-5	8.0%	20.0%	40.0%	24.0%	2.0%	6.0%
5-9	5.9%	5.9%	29.4%	52.9%	2.9%	2.9%
>9	5.0%	12.5%	30.0%	40.0%	12.5%	0.0%

Chi-square of independence of rows and columns = 55.4947, df = 15, p-value = 1.474e-06.

Most recent surveys of institutional investors report a significant allocation to hedge funds. It is difficult to reconcile this with our questionnaire evidence. Given that we find modern portfolio theory is the basis for asset allocation, it is difficult to see how more than 60% of the investors in our survey can score hedge funds in the “least comfortable” or “don’t know” category.

To look at the relationship between comfort and allocation *within* an asset class, we test whether the comfort of extrapolation is associated with allocations to real estate. We cross-tabulate allocation with the responses to question 15, and report the results in Exhibit 12.

Even though managers were relatively confident about real estate as opposed to other alternative asset classes, Exhibit 12 indicates a strong relationship between confidence of extrapolation and target allocation. Thus, *at the margin*, uncertainty matters, although the information basis for large-scale decisions about asset classes remains something of a puzzle.

Exhibit 12 suggests that one of two things is going on—either investors base their allocation decision about real estate on the degree of certainty about the statistical inputs to the optimization process, or else they are justifying their relatively high allocation *ex post* by claiming to be more confident. The latter explanation is

less persuasive, given the overall low allocation to real estate by the institutions in the sample—although they are likely to all be aware of peer allocations and their relative position.

Experience and Expectations

A measure related to confidence about the performance of real estate may be the direct experience a fund has had with the asset class. We cross-tabulate this variable as well.

Exhibit 13 shows a strong relationship between length of time invested in real estate, but the relationship is non-linear. For those invested less than 10 years in RE, the comfort level with extrapolation is 3. For those invested between 11 and 20 years, the comfort level is 4. For those over 20 years, the comfort level is 3. This might be a sign that the 1980s boom and crash affected trust in historical data inputs for institutions.

Closely related to uncertainty about the distribution is the expectation of a crash in asset prices—in statistical terms, tail event risk. In question 17 we asked: “In your opinion, and based on the scale below, how likely is it that you will experience a ‘crash’ in values of the following asset classes in the next 10 years? (A ‘crash’ is defined as a decline in values of more than 30%.).” Results are reported in Exhibit 14.

Equities are regarded as having the highest likelihood of a crash in the next decade; the median answered “somewhat likely,” and nearly 14% regarded the event as very likely. Both real estate and fixed-income score lower on crash likelihood; the median response is “not too likely.”

To test whether crash assessment is associated with investment in real estate, we cross-tabulate this variable with target allocations. There is a negative and statistically significant relationship between crash assessment in real estate and investment in real estate.

It is interesting to note that judgments of low-probability events such as crashes are rarely based on complete data but rather on what is available. In particular, investment decisions require investors to take into account worst case scenarios, such as bubbles and crashes. Research in judgment and decision-making finds that certain types of information are overweighted in making judgments of events relative to other data. Investors are likely to estimate the likelihood of an event depending on how easily

EXHIBIT 13

Comparison of Years Invested in Real Estate with Comfort of Extrapolation

Years	Least com.	2	3	4	Most com.	Don't know
0-2	18.2%	9.1%	29.1%	20.0%	0.0%	23.6%
3-4	5.7%	24.5%	34.0%	26.4%	3.8%	5.7%
5-10	3.7%	14.8%	25.9%	44.4%	7.4%	3.7%
11-20	9.7%	9.7%	25.8%	45.2%	6.5%	3.2%
20+	0.0%	14.3%	42.9%	28.6%	14.3%	0.0%

Chi-square of independence of rows and columns is rejected with a high degree of confidence: Chi-square = 37.8769, $df = 20$, $p\text{-value} = 0.009167$.

EXHIBIT 14

Question 17—Crash Likelihood in Next 10 Years

A Crash is:	Real Estate	U.S. Equities	Fixed-Income
Not at all Likely	2.9%	1.7%	13.9%
Not Too Likely	45.7%	30.6%	50.9%
Somewhat	28.3%	43.9%	20.2%
Very	10.4%	13.9%	5.2%
Extremely	1.2%	0.6%	0.0%
Don't Know	11.6%	9.2%	9.8%

Chi-square of independence between rows and columns = 25.4751, $df = 15$, $p\text{-value} = 0.04392$.

they can recall instances of it. Furthermore, investors who recall a real estate crash relatively easily are more likely to be averse to investing in real estate, even though the future occurrence of a crash is unlikely. As availability is affected by factors other than probability, reliance on availability of evidence leads to potential bias against investing in real estate.

CONCLUSIONS

We have collected information about the real estate allocation choices, beliefs, and viewpoints of a set of the nation's leading investment managers. The results of our questionnaire provide a rare glimpse into frameworks used to evaluate the relative attractiveness of real estate as an asset class. There are (first of all) significant institutional differences in the sample—endowments and foundations have a relatively short history of real estate investing, and are more likely to be shifting toward the asset class.

Our investigation of the asset allocation process yields interesting results. There is strong evidence to suggest that modern portfolio theory forms the general basis for the real estate asset allocation decision—statistical risk and return estimates and long-term performance are said to be the major determinants of the allocation decision. Our

respondents located real estate between stocks and bonds on both dimensions. They regarded the costs associated with real estate investing as relatively high compared to stock and bond portfolios.

One of our main goals was to explore the potential role of a broader range of risk and uncertainty measures in the investment decision-making process, particularly with regard to real estate in the institutional portfolio. By focusing on investors' perceptions about what they don't know, we sought to test some hypotheses about the influence of uncertainty and multidimensional risk.

The potential relevance of uncertainty is immediately evident in many of the questionnaire results. In many questions, we observed significant differences in the "I don't know" response with regard to views on various asset classes. This alone suggests heterogeneity in uncertainty about the statistical distribution of returns.

In our asset class questions, we included the risk of the asset selling for a price different from its economic value (characterized as inability to sell at the right price, and risk of buying at the wrong price), on a variable capturing uncertainty about the extrapolation of historical performance, and a measure of extreme negative events—a crash likelihood. The results of our tests suggest that both uncertainty and efficiency are relevant. We find a positive but insignificant association between efficiency measures and allocation, a positive and significant association between historical extrapolation confidence and allocation, and marginal (but significant) evidence of a negative relation between crash risk and allocation to real estate.

These are potentially interesting relations between beliefs and decision-making under uncertainty, although we cannot infer causality from these associations. There is considerable behavioral evidence that people adjust beliefs to match actions rather than vice versa. If this is true, then

perception follows action, rather than vice versa. Given the strong trend of investment into real estate, it would thus be interesting to track the evolution in beliefs about the asset class conditional upon past choice.

While our results reveal factors influencing the allocations to real estate, the overall logic of portfolio allocation to assets other than stocks and bonds remains somewhat of a mystery. Although we find that investors rely heavily on statistical inputs for the allocation decision, they are least comfortable with using past returns to extrapolate the performance of hedge funds, venture capital, and commodities. This evidence is clearly in conflict with the dramatic increase in hedge fund and venture capital allocations by institutional investors over the last market cycle. Alternative motives such as return-chasing and following the industry leader must be considered alternative explanations.

ENDNOTES

The authors thank the PREA for funding this research; Drew Haluska for able support; Greenwich Associates for implementation; and particularly the respondents to the survey for their willingness to participate.

¹To check internal consistency, we asked whether those planning to increase their allocation to real estate also reported being below their target allocation. The relationship was positive and highly significant.

²We were able to test the proposition that reliance on actions taken by industry peers or advice from consultants might influence differences in the decision to increase allocations to real estate. Neither factor explained the decision to increase versus the decision to stay the same or reduce allocations.

³Camerer and Kunreuther [1989], Epstein and Wang [1994], Di Mauro and Maffioletti [2001], Routledge and Zin [2001], Epstein and Schneider [2002], Asano [2004], and Walden [2004] find that uncertainty can induce investors to avoid assets and markets; cause asset prices to deviate significantly from economic value; and cause risk-taking behavior to appear irrational when measured within a classic framework.

REFERENCES

- Asano, Takao. "Portfolio Inertia and Contaminations." ISER Discussion Paper No. 610, June 2004. Available at <http://ssrn.com/abstract=562621>.
- Bewley, Truman F. "Knightian Decision Theory—Part I." Cowles Foundation Discussion Paper No. 1053, 1986.
- Camerer, Colin F., and H. K. Kunreuther. "Decision Processes for Low Probability Risks: Policy Implications." *Journal of Policy Analysis and Management*, 8 (1989), pp. 565-692.
- Di Mauro, Carmela, and Anna Maffioletti. "Reaction to Uncertainty and Market Mechanisms: Experimental Evidence." Working paper, Mannheim University, 2001.
- Epstein, Larry, and Martin Schneider. "Learning Under Ambiguity." Working paper, 2002. Available at <http://ssrn.com/abstract=344920>.
- Epstein, Larry G., and Tan Wang. "Intertemporal Asset Pricing Under Knightian Uncertainty." *Econometrica*, 62(2) (1994), pp. 283-322.
- Hirshleifer, David, and Ivo Welch. "An Economic Approach to the Psychology of Change: Amnesia, Inertia, and Impulsiveness." *Journal of Economics and Management Strategy*, 11-3 (2002), pp. 379-421.
- Knight, F. H. *Risk, Uncertainty and Profit*. Boston: Houghton Mifflin, 1921.
- Routledge, Bryan R., and Stanley E. Zin. "Model Uncertainty and Liquidity." Working paper, 2001. Available at <http://ssrn.com/abstract=302485>.
- Tversky, Amos, and Daniel Kahneman. "Judgment Under Uncertainty: Heuristics and Biases." *Science*, 185 (1974), pp. 1124-1131.
- Walden, Johan. "Real Investments under Knightian Uncertainty." Yale ICF Working Paper No. 04-08, 2004. Available at <http://ssrn.com/abstract=509643>.
- To order reprints of this article, please contact Dewey Palmieri at dpalmieri@iijournals.com or 212-224-3675.*

©Euromoney Institutional Investor PLC. This material must be used for the customer's internal business use only and a maximum of ten (10) hard copy print-outs may be made. No further copying or transmission of this material is allowed without the express permission of Euromoney Institutional Investor PLC. Copyright of *Journal of Portfolio Management* is the property of Euromoney Publications PLC and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.

The most recent two editions of this title are only ever available at <http://www.euromoneyplc.com>